Survey of Modeling Practices

Conducted in First Quarter 2000

MARICOPA ASSOCIATION of GOVERNMENTS

302 North 1st Avenue, Ste 300, Phoenix, Arizona 85003

Questionnaire

SOCIOECONOMIC MODELING

1. **Who is responsible for socioeconomic modeling in your region?**
   Organization:
   Contact Person:
   Position:
   Telephone No.:
   Email:

2. **What is the total population for your region? What is the land area (in sq. mi.) of your region?**

3. **What has the average annual rate of population growth been for your region over the last five years?**

4. **What is the general methodology used to generate regional/county level population and employment projections?**

5. **How often are the adopted population and employment projections generated? What is the time horizon for the projections? In your opinion, is this time horizon adequate to capture the growth in your region?**

6. **What levels of geography do you model for? How many polygons are in each level? Are any of these levels consistent with Census Geography (Tracts/Block Groups/Blocks)?**

7. **What land use/socioeconomic models are you currently using? What models do you plan to use in the future?**

8. **What are the major categories you use for land use modeling? Are your employment categories based on SIC/NAICS or land use?**

9. **Is there a travel time/accessibility feedback loop between your transportation and land use models? If so, how many iterations are performed to achieve equilibrium? Is this feedback loop used in all land use modeling applications?**

10. **How is output of the land use models translated into transportation model input?**

11. **What review process do you use for the land use projections at a technical level? At a policy level?**

12. **What population projections do you use in conducting transportation conformity analyses? Have you had any problems synchronizing the timing of the population projections with your conformity analyses, given that EPA regulations require the "latest" planning assumptions to be used in conformity?**

13. **Do you develop land use scenario alternatives for transportation options to respond to EPA Clean Air Act requirements? If so, how are these created?**

14. **What enhancements, if any, have you made to your land use models to meet requirements of the Clean Air Act and attendant EPA regulations (i.e. Section 93.122 of federal conformity rule)?**

TRANSPORTATION MODELING

1. **Who is responsible for transportation modeling in your region?**
   Organization:
   Contact Person:
   Position:
   Telephone No.:
   Email:

2. **What transportation models are you currently using? What models do you plan to use in the future?**

3. **What enhancements, if any, have you made to your transportation models to meet requirements of the Clean Air Act and attendant EPA regulations (i.e. Section 93.122 of federal conformity rule)?**

AIR QUALITY/TRANSPORTATION CONFORMITY MODELING

1. **Who is responsible for air quality modeling in your region?**
   Organization:
   Contact Person:
   Position:
   Telephone No.:
   Email:

2. **Is your region designated a nonattainment area? If so, for which pollutants and what is your classification for each pollutant (i.e. Moderate, Serious, Severe, etc.)**

3. **What air quality models are you currently using? What models do you plan to use in the future?**

	SOCIOECONOMIC MODELING	ALBUQUERQUE (MRGCOG)	ATLANTA (ARC)	DALLAS (NCTCOG)	DENVER (DRCOG)
1	**Agency**	Middle Rio Grande Council of Governments	Atlanta Regional Commission	North Central Texas Council of Governments	Denver Regional Council of Governments
2	**Total Population**	700,000	3,204,900 (April 1,1999)	5,100,000 (Jan 1, 2000)	2,286,975 (Jan 1, 1999)
3	**Land Area**	9289 sq mi	2,987 sq mi	12,500 sq mi	5,076.3 sq mi; 1999 urbanized area - about 585 sq mi
4	**Annual Rate of Population Growth (Past 5 Yrs)**	1-2%	2.90%	Growth of 5% over the last five yrs.	2.6% (vs. 1.3% between 1980-1990)
5	**Methodology - Regional Projections**	University of New Mexico, Bureau of Business Research, provides county level forecasts. Use REMI econometric model to take employment from 5 to 20 yr horizon.	Region level (13 counties) forecast produced using cohort component model with econometric forecast of employment. Iterative model balances available labor force with employment by adjusting migration. DRAM/EMPAL used for census tract allocations.	Use State of Texas generated control totals for population and employment.	Annual population estimates developed using building permits, utility connections & school enrollment, combined with cohort information. Employment estimates every 3 yrs from ES-202 and Dun and Bradstreet data. Survey information supplements non-202 data. Currently reviewing methodology, type of information and frequency of estimation efforts.
6	**How Often are Projections Generated? What is the Forecasting Time Horizon?**	Every 3 years to correspond with metropolitan transportation plan cycle. Horizon: 20 yr. Also do some 50 yr projections.	In the past, new forecasts were generated every 5 yrs, but will likely go to 3 yrs due to Clean Air Act. Latest forecast horizon is 2025 in 5 yr intervals.	Every 3 yrs with a 25-30 yr horizon.	Regional forecast adopted every 10 yrs with a horizon of 25 yrs in 5 yr intervals. TAZ forecasts undertaken on an annual basis, maintaining the regional forecast total.
7	**Levels of Geography & Consistency with Census Geography**	4 counties ; 665 TAZs. 99% consistent with census tracts.	437 census tracts in 13 counties; 948 TAZs subdivided from census tracts.	300 forecast districts and 6000 traffic survey zones (TSZs). Forecast districts are aggregations of census tracts. TSZs are aggregations of census blocks.	Recently adopted new TAZ system linked/nested in census geography. Two-tier forecasts to 600 census tracts, then to 3000 TAZs.
8	**Land Use Models - Current**	Land Allocation Model (LAM) with 32 sub areas.	Regional model is ARC-modified version of IPEF (Interactive Population & Econometric Forecasting) originally developed by SANDAG in 1980's. METROPILUS version of DRAM/EMPAL used for allocation.	DRAM/EMPAL is used for district allocations. In-house allocation method used to apportion data from district to TSZ.	Internally-developed palling model. Documentation available during next two months.
9	**Land Use Models - Future**		Same.	Other methods and tools are being sought.	ReSEM - multistage, multidimensional decision choice system model which will forecast development at the 600 census tract level. Will be linked to GIS (likely ArcView). To be completed in 2002. Description available upon request.
10	**Land Use Modeling Categories**	Land use: 18 categories. Employment: by 1 digit SICs: agriculture, mining, construction, wholesale, retail, FIRE (finance, insurance, & real estate), manufacturing, TCU (transportation, communications, utilities), service, military, government. Conversion table from SIC to land use.	Households in 4 income categories: under $20K; $20-40K; $40-60K; over $60K. Employment in 8 industry groups: construction; manufacturing; transportation, communications and utilities (TCU); wholesale trade; retail trade; FIRE; services and miscellaneous (service jobs plus agriculture, mining, etc). Employment categories conform to SIC definitions. Land Use in 5 categories: undevelopable; basic employment; commercial employment; residential, and vacant developable.	The categories are based on SIC: manufacturing; transportation; public utilities; retail, finance, insurance and real estate; service; government. The major groups are manufacturing, office, warehouse/industrial, and other. Converted to land-use at TSZ level.	Currently using 3 employment groupings based on SIC plus "Other" group for non-202 workers. Households divided into 3 income groups. May expand to 5 or 6 employment categories and 7 income categories. Will be changing to NAICS in 2001 and considering change to occupational distributions. A comprehensive travel behavior survey is being conducted. After further analysis, may switch to household lifecycle forecasting and distributions.
11	**Travel Time/Accessibility Feedback Loop Between Transportation and Land Use Models**	No.	None.	Feedback loop in DRAM/EMPAL is used. Converges in 3 iterations.	Currently implementing a travel time input to socioeconomic forecasts. A more dynamic approach to utilization of travel time equilibrium may be included in the model improvement program.
12	**Conversion to Transportation Model Input**	Convert employment by LU category output by LAM to 3 categories by TAZ required by transportation models. Dwelling units by TAZ go directly from LAM to transportation models.	Tract-level forecasts are disaggregated to TAZs using a zonal allocation procedure that considers base year distributions of population, employment, and vacant land.	District matrix of population and employment is applied.	Forecast data is adjusted to the form required by the MINUTP travel model, using Paradox.
13	**Review Process (Technical and Policy)**	Reviewed and recommended by public involvement and technical committees and transportation board prior to adoption by COG board.	Technical level review by Research Division and Transportation Division staff. Policy inputs are determined by a committee of interested citizens, local planners, etc. Lengthy process involving extensive public comment.	A Demographic Forecast Task Force meets regularly to review district model results. Local city planners review the TSZ allocations.	Regional forecast and socioeconomic model are reviewed by Forecast Task Force of economists, business analysts, and member government planners. Adopted by Board of Directors. Small area forecasts are reviewed, but not adopted.
14	**Projections Used in Transportation Conformity**	Results from Transportation model used in MOBILE 5A.	ARC forecasts.	Forecasts generated from allocation by the models are used.	Use regional forecast adopted once a decade (minimum). Annually, local planning and development information is updated into the socioeconomic model, which is run to produce information for critical conformity analysis years.
15	**Land Use Scenarios Generated to Meet Clean Air Act (CAA) Requirements**	Yes. Change the input land use scenario (different LU layer).	An ARC Land Use Task Force recommended some policy changes that were reflected in the DRAM/EMPAL model runs.	Regional Transportation Plan (Mobility Plan), developed every 3 yrs, uses a single baseline land use/demographic scenario.	Build & no-build alternatives are produced by the socioeconomic model using different development (transportation networks, travel time, and roadway congestion) inputs.
16	**Enhancements to Land Use Models for Air Quality Planning**	None.	None.	Feedback loop in DRAM/EMPAL.	Have recently adjusted socioeconomic model to represent a dynamic, self-informing development approach using five year development cycles.

	TRANSPORTATION MODELING	ALBUQUERQUE (MRGCOG)	ATLANTA (ARC)	DALLAS (NCTCOG)	DENVER (DRCOG)
1	**Agency**	Middle Rio Grande Council of Governments	Atlanta Regional Commission	North Central Texas Council of Governments	Denver Regional Council of Governments
2	**Transportation Models - Current**	EMME2	TRANPLAN	Dallas-Fort Worth Regional Travel Model (DFWRTM) composed of customized FORTRAN and SAS programs running on IBM mainframe located at Texas A&M. Derived from UTPS. Also use TRANPLAN for thoroughfare planning studies.	Traditional 4 step model.
3	**Transportation Models - Future**	Same.	TP+/VIPER	Developing new travel demand model system based on TransCAD. After successful calibration and validation, will be used for some applications in early 2001. Next Regional Transportation Plan scheduled for completion in Jan 2003 will use TransCAD.	Same with enhancements.
4	**Enhancements to Transportation Models to Meet CAA requirements**	Modal choice model added. Alternative land use scenarios generated to meet conformity requirements.	Ongoing strategic travel demand enhancement program. National peer review of model in 1995 and 2000. Full feedback of congested travel times (4 iterations). Separate HOV assignment procedure. Improved commercial truck and external travel models. Time-of-day highway assignments. Empirically-observed speeds. Travel impedance input to land use model. Highway and transit validations have been performed. Model calibrated for 1990 and validated against 1995 data. Modeled VMT is within 3% of HPMS.	Feedback of traffic assignment times to trip distribution; emissions estimates based on five link-level time-of-day speeds.	Multi-period, multi-class equilibrium assignment with improved volume-delay functions. Improved assignment with trip distribution speed balance method.
	AIR QUALITY/TRANSPORTATION CONFORMITY MODELING				
1	**Agency**	Middle Rio Grande Council of Governments	Atlanta Regional Commission	North Central Texas Council of Governments	Air Pollution Control Division, State Health and Env. Dept.
2	**Nonattainment Area/Classification**	Maintenance Area for CO.	Serious nonattainment area for ozone.	Serious nonattainment area for ozone.	Nonattainment area for CO, ozone & PM-10.
3	**Air Quality Models - Current**	MOBILE5A	Link-based emissions model using MOBILE5B. Link speeds are post-processed using final capacity-restrained volumes from travel demand model for a.m., p.m. & off-peak periods.	MOBILE5AH for vehicle emission rates; DFWRTM to determine vehicle activity. For SIP development, TNRCC uses the Comprehensive Air Quality Model with Extensions (CAMx); NCTCOG supplies regional data for modeling.	MOBILE5A
4	**Air Quality Models - Future**	MOBILE6	MOBILE6		MOBILE?

	SOCIOECONOMIC MODELING	HOUSTON (HGAC)	LAS VEGAS (RTC)	LOS ANGELES (SCAG)	MICHIGAN (SEMCOG)
1	Agency	Houston-Galveston Area Council	Regional Transportation Commission of Clark County, NV	Southern California Association of Governments	Southeast Michigan Council of Governments
2	Total Population	4,618,803 (1999)	1,355,400 (Jan 1, 2000)	16,700,000	4,833,602 (Feb 2000)
3	Land Area	12,500 sq mi	547.5 sq mi	38,000 sq mi	4,600 sq mi
4	Annual Rate of Population Growth (Past 5 Yrs)	2.50%	6.38% - 36% growth over five years.	1.30%	0.70%
5	Methodology - Regional Projections	In July 1999, the REMI econometric model was used under high, moderate and low growth scenarios to forecast regional population and employment growth.	REMI model. Input from University of Nevada, Las Vegas (UNLV).	Population: cohort survival, Employment: shift shares.	Regional population and employment based on REMI model runs by University of Michigan. Allocated to districts using DRAM/EMPAL; allocated to TAZs by SEMCOG program (ZAP); TAZs are then aggregated to counties.
6	How Often are Projections Generated? What is the Forecasting Time Horizon?	Anticipate every 4 yrs.	Every yr with a horizon of 2020 in 10 yr increments. Need projections in 5 yr increments.	Every 3- 4 yrs. Horizon: 25 yrs.	Every 5 yrs; after current forecast, will go to 3 yrs. Horizon: 25-30 yrs. Some updates and modifications necessary to reflect special development projects in between forecasts.
7	Levels of Geography & Consistency with Census Geography	Control totals for CMSA; 199 Regional Analysis Zones (RAZs). RAZs are consistent with groupings of census tracts.	751 TAZs (based on parcel data). 1140 TAZs in new model. Follow census tracts.	Counties: 6, subregions: 14, cities: approx 200, census tracts: approx 2500, TAZs: approx 3200, micro-geographic units: approx 150,000. Consistent with census geography.	Forecast Districts (247) and TAZs (1442). TAZs consist of census blocks.
8	Land Use Models - Current	DRAM/EMPAL used to allocate to RAZs. Also employ spreadsheet analysis.	In-house Small Area Allocation Model (SAAM) - MS Access based.	In-house developed Small Area Allocation Model (SAAM).	REMI (regional forecast), DRAM/EMPAL (allocates to 247 forecast districts), ZAP (allocates to TAZs); post-processing to generate other socioeconomic variables.
9	Land Use Models - Future	Undertaking 2 year project to adopt new land use model and create additional methods to assess accuracy of land use database and modeling. UrbanSim is leading candidate.	Updated SAAM.	SAAM (improved).	METROPILUS instead of DRAM/EMPAL, plus enhancements to ZAP and post-processing procedures.
10	Land Use Modeling Categories	With DRAM/EMPAL, employment categories were retail, commercial, industrial, government, medical, and other, based on land use. In process of redefining land use categories; may increase number.	Employment categories: hotel/resort, office, industry, retail, other non retail, special generators.	Residential and employment activity by developed and vacant land use. Employment is based on SIC.	8 household categories: income quartiles with and without children. 8 employment categories based on SIC: agriculture, mining, natural resources (SIC 01 to 14), manufacturing (SIC 20 to 39), TCU (SIC 40 to 49), wholesale trade (SIC 50 to 51), retail trade (SIC 52 to 59), FIRE (SIC 60 to 67), services (SIC 70 to 89), public administration (SIC 91 to 97).
11	Travel Time/Accessibility Feedback Loop Between Transportation and Land Use Models	No.	Travel time-land use feedback loop tested during model calibration (6 iterations to achieve equilibrium).	None.	Not used in last forecast, but planned to be used in next forecast.
12	Conversion to Transportation Model Input		Entities (cities and county) translate land use acreage into population and employment.	SAAM-> TAZ residential and job distribution->"post processor" programs->transportation input variables.	SEMCOG's post-processing procedures generate data for transportation model input.
13	Review Process (Technical and Policy)	Data Services Technical Committee (regional experts from public and private sector) reviews and approves RAZ level population & employment. Then Board of Directors officially adopts forecast.	Check with parcel level information provided by each entity.	Technical: cities, tracts, TAZs. Policy: region, county, city.	DataCenter Advisory Committee and communities review forecasts. Approved by SEMCOG's General Assembly.
14	Projections Used in Transportation Conformity		Valley population control totals adopted by RTC using input from UNLV.		Adopted numbers from SEMCOG.
15	Land Use Scenarios Generated to Meet Clean Air Act (CAA) Requirements		The entities develop their own Master Plans and land use scenarios. The entities use the Valley population control totals adopted by the RTC Commission.	No.	No.
16	Enhancements to Land Use Models for Air Quality Planning	Evaluating UrbanSim model with enhanced ability to integrate with EMME/2 & incorporate successive future road networks, land value data, policy constraints, etc. Open source code allows "localization" of the model.	Contact Clark County Comprehensive Planning.	None.	None.

	TRANSPORTATION MODELING	HOUSTON (HGAC)	LAS VEGAS (RTC)	LOS ANGELES (SCAG)	MICHIGAN (SEMCOG)
1	**Agency**	Houston-Galveston Area Council	Regional Transportation Commission of Clark County, NV	Southern California Association of Governments	Southeast Michigan Council of Governments
2	**Transportation Models - Current**	Customized models for trip generation and mode choice. Texas DOT model for trip distribution. EMME2 for assignments and skims.	TRANPLAN	TRANPLAN	TRANPLAN
3	**Transportation Models - Future**	Will adopt TxDOT's trip generation model for Track I standard practice set. Developing "Advanced Practice" set of models.	TransCAD		Reviewing TRANSCAD & TP+
4	**Enhancements to Transportation Models to Meet CAA requirements**	Developed post assignment speed estimation model to estimate time-of-day speeds from time-of-day volume to capacity ratios using traditional HCM relationships. Also recycle AM peak period post-assignment speeds to mode choice model.	TIP and RTP, TDM, Transit System Enhancement, and Fixed Guideway.		Conducted travel survey of 6700 households and an on-board transit survey. Using survey data, several model parameters and coefficients were updated.
	AIR QUALITY/TRANSPORTATION CONFORMITY MODELING				
1	**Agency**	Houston-Galveston Area Council	Regional Transportation Commission of Clark County, NV	South Coast Air Quality Management District	Southeast Michigan Council of Governments
2	**Nonattainment Area/Classification**	Severe II nonattainment area for ozone.	Serious nonattainment area for CO and PM-10.	Extreme nonattainment area for ozone. Serious nonattainment area for CO and PM-10.	Redesignated in attainment for ozone (Feb '95), CO (Aug '99), and PM-10 (Oct '96).
3	**Air Quality Models - Current**	MOBILE5AH	MOBILE5 (CO); PART5 (PM10); CAL3QHC (hot spots).		MOBILE5A & AIRCON/CONTEMP (ozone precursors & CO emissions). No concentration modeling done in-house. SEMCOG provides link level hourly VMT & speeds to Lake Michigan Air Directors Consortium which generates mobile source emissions inventories with EMS95 model.
4	**Air Quality Models - Future**	Same			

	SOCIOECONOMIC MODELING	MINNEAPOLIS/ST. PAUL (METRO COUNCIL)	MOUNTAINLAND, UTAH (MAG)	NEW JERSEY (NJTPA)	PHOENIX (MAG)
1	Agency	Metropolitan Council of Twin Cities	Statewide: Utah Governor's Office of Planning and Budget Regional: Mountainland Association of Governments.	New Jersey Transportation Planning Authority	Maricopa Association of Governments
2	Total Population	In 1998: 2,544,353 - 7 counties, (legislatively-defined jurisdiction); 2,831,234 - 13 county Twin Cities MSA	361,213 (2000)	6,100,000 (1999)	2,913,475 (July 1,1999)
3	Land Area	2976 sq mi (total), 2801 (land area without lakes, streams, wetlands)	2,143.5 sq mi	4,200 sq mi	9,231.6 sq mi
4	Annual Rate of Population Growth (Past 5 Yrs)	1.31%	2.35%	0.60%	4%
5	Methodology - Regional Projections	Cohort-survival model for regional age-specific forecasts. Employment is stepped down from BEA's MSA forecast. Checks done with NPA&Woods, Poole and demographic model forecasts.	From Governor's Office of Planning and Budget (GOPB). Use Utah Population and Economic Development Model (UPED).	County projections use New York Metro Transportation Council (NYMTC) growth rate. Disaggregated to MCDs using input from counties and Office of State Planning (OSP) Growth Simulation Model. Employment base from NJ Dept of Labor; some projections supplied by counties.	Population projections from Arizona Department of Economic Security after census. MAG applies employment to population ratios to derive County level employment.
6	How Often are Projections Generated? What is the Forecasting Time Horizon?	About every 5 yrs with a horizon of 25 yrs. Process takes 2-3 yrs.	Horizon: 20 - 50 yrs.	Every 5-7 yrs. Horizon: 25 yrs.	Every 5 yrs with a 25 yr horizon.
7	Levels of Geography & Consistency with Census Geography	4 quadrants and development rings within them; 186 cities and townships (MCDs), 1165 internal TAZs. TAZs are aggregations of census blocks.	TAZs are nested within census tracts.	Model census tracts and disaggregate to block groups. TAZs consistent with MCDs.	Municipal Planning Areas (27), Regional Analysis Zones (147), TAZs (1541). TAZs generally conform with census blocks.
8	Land Use Models - Current	Trend-based step-down of regional totals to subareas and MCDs. Considers vacant land, res/non-res split, single/multi-family split, and density by housing type. Growth assumed to move outward. Extensive local review.	UrbanSim - Under development by Paul Waddell.	No land use/socioeconomic model used on a regular basis - OSP Growth Simulation Model has been used in developing population projections.	DRAM/EMPAL used to allocate County control totals for households and employment to RAZs. Subarea Allocation Model (SAM) distributes dwelling units & employment by type to TAZs.
9	Land Use Models - Future	Expanding & improving parcel level information. Envision using same method with better land use, vacant land and redevelopment trend data.	UrbanSim.		Considering METROPILUS, UrbanSim and Delta; plus enhancements to GIS-based SAM.
10	Land Use Modeling Categories	Land use: vacant (less wetlands), steep slope, woodland or other undevelopable features, single family land, multi-family land. Employment: only forecast total jobs - assumed to fit on remaining land after residential mix is set. Also have estimates of jobs by major SIC group.	Under development.	No land use modeling at the current time.	DRAM/EMPAL models households by 5 income groups and employment by 5 land uses (retail, office, public, industrial, other). A work-at-home category is added in SAM. Use county level equivalency matrix to convert employment by SIC/NAICS to land use type. Also allocate special population groups to TAZs using SAM.
11	Travel Time/Accessibility Feedback Loop Between Transportation and Land Use Models	None.	Plan to use feedback loop with UrbanSim. TP+ model will use a convergence algorithm being developed by Michael Baker Jr. Inc.	The travel time/accessibility loop in the travel demand model is the closest proxy for modeling land use. 15 iterations for conformity.	Have developed a feedback capability.
12	Conversion to Transportation Model Input	MCD level control totals are provided to cities and townships which allocate to TAZs based on historic TAZ level data, the regional land use inventory, and their land use plans.	Land use model will provide input data for transportation model directly in ASCII format. In future, will be converted to a DBF file to be read directly by TP+	Major inputs to the transportation model are population by zone and employment by zone.	TAZ trip generation data is produced by the Subarea Allocation Model (SAM).
13	Review Process (Technical and Policy)	Iterative process involving forecasters, planners, decision-makers, local officials and public. Public meetings on growth options; technical review by MCDs; formal review of plans.	Utah Valley Technical Advisory Committee, Utah Valley Planning Committee, Mountainland Executive Council	Projections adopted by Board of Trustees. Reviewed by Regional Technical Advisory Committee comprised of planners.	Population Technical Advisory Committee (POPTAC) reviews and approves socioeconomic projections at TAZ level. Approved by Management Committee and adopted by Regional Council.
14	Projections Used in Transportation Conformity	Use projections associated with current regional transportation policy plan, updated every 3-5 yrs.	Output from the Transportation models used.	Adopted projections.	Official TAZ projections adopted every 5 years.
15	Land Use Scenarios Generated to Meet Clean Air Act (CAA) Requirements	Alternative land use scenarios for the "Regional Blueprint" were generated from a series of public focus groups.	Not at this time.	No.	Build and No build scenarios using DRAM/EMPAL.
16	Enhancements to Land Use Models for Air Quality Planning	None.	None to the land use model.	Not applicable.	Travel time feedback loop between land use and transportation models has been developed.

	TRANSPORTATION MODELING	MINNEAPOLIS/ST. PAUL (METRO COUNCIL)	UTAH, MOUNTAINLAND (MAG)	NEW JERSEY (NJTPA)	PHOENIX (MAG)
1	**Agency**	Metropolitan Council of Twin Cities	Mountainland Association of Governments.	New Jersey Transportation Planning Authority	Maricopa Association of Governments
2	**Transportation Models - Current**	TRANPLAN, with stand-alone models for trip generation, mode choice, temporal distribution, auto ownership & composite impedance.	TP+	TRANPLAN v.9, VIPER	EMME/2
3	**Transportation Models - Future**	TP+ and VIPER; travel behavior survey in 2000 will enable conversion to tour-based model.		TP+	May participate in a test of TRANSIMS.
4	**Enhancements to Transportation Models to Meet CAA requirements**	1990 traffic volumes validated against 6,563 traffic counts. Accessibility feedback loop from assignment to trip generation, distribution and mode choice. BPR curves calibrated against 1990 survey speeds.	Numerous enhancements being made to model to make it more sensitive to non-motorized travel and transit.	Validating model to 1996 conditions. Use capacity sensitive assignment and zone-to-zone travel impedances in trip distribution. Travel volumes are reconciled with HPMS. Travel time/accessibility feedback loop.	1995 traffic volumes validated by traffic surveys. Initiated a 5 iteration travel impedance feedback loop. Conduct travel time surveys.
	AIR QUALITY/TRANSPORTATION CONFORMITY MODELING				
1	**Agency**	Metropolitan Council of Twin Cities	Mountainland Association of Governments	New Jersey Transportation Planning Authority	Maricopa Association of Governments
2	**Nonattainment Area/Classification**	Redesignated a CO maintenance area in 1999.	Moderate nonattainment area for CO and PM10.	Severe nonattainment area for ozone (VOCs and NOx). Maintenance area for CO.	Serious nonattainment area for CO, ozone, and PM-10.
3	**Air Quality Models - Current**	MOBILE5A and EMIS; hotspot analysis is responsibility of government entity implementing the project.	MOBILE5	MOBILE5AH	MOBILE5A and EPS for emissions modeling; CAL3QHC for hotspot modeling; UAM for ozone & CO; UAM-LC (linear chemistry) for PM-10. Emissions and concentration modeling done in-house.
4	**Air Quality Models - Future**	MOBILE6	MOBILE6	MOBILE6	

	SOCIOECONOMIC MODELING	PORTLAND (METRO)	SACRAMENTO (SACOG)	SALT LAKE CITY (WFRC)	SAN DIEGO (SANDAG)
1	Agency	Metro Data Resource Center	Sacramento Area Council of Governments	Wasatch Front Regional Council	San Diego Association of Governments
2	Total Population	In 1999: 1,229,224 (area of legal authority); 1,715,450 (4 county region); 1,202,008 (urban growth boundary-UGB)	1,850,400 (Jan 1, 1999)	1,307,838 (for 5 counties) - July 1, 1999.	2,853,000 (Jan 1, 1999)
3	Land Area	461.8 sq mi (area of legal authority); 3725 sq mi (4 county region); 369 sq mi (UGB)	6,190 sq mi	1470 sq mi (5 counties), 309 sq mi (3 county modeling area)	4260.5 sq mi
4	Annual Rate of Population Growth (Past 5 Yrs)	1.23% (area of legal authority); 1.83% (4 county region); 1.05% (UGB)	1.4% (7.1% for 5 years)	1.59%	1.6% or approximately 42,000 per yr.
5	Methodology - Regional Projections	Regional Econometric Model forecasts employment by SIC, population by age cohort, labor force, and income.	Use consensus method based on General Plans and discussions with planning departments. Regional population cap, based on the CA Department of Finance projections; balance maintained between population & employment growth.	Resident population, households, and employment by 2 digit SIC are projected by the Governors Office of Planning and Budget (GOPB) at County level.	Demographic and Economic Forecasting Model (DEFM). Nonlinear econometric model with cohort component demographics linked through housing, construction, migration. Rebuilt in 1998. Official forecast accepted by SANDAG Board of Directors and used by all planning agencies in County.
6	How Often are Projections Generated? What is the Forecasting Time Horizon?	Every 5 yrs with a horizon of 20 yrs in 5 yr increments for transportation planning; 40+ yrs for regional conceptual planning.	Every 3 yrs when the long range plan is updated. Current projections go to 2022; next projections to 2025.	GOPB releases new control totals every 3 years. Projections are through 2030.	Every 5 yrs with a horizon of 25 yrs. Planning to increase horizon to 30 yrs.
7	Levels of Geography & Consistency with Census Geography	6 County CMSA; 4 County economic region; 20 Districts, 1336 TAZs. Census tracts used for residential modeling; aggregations of tracts for non-residential. Data are consistent at census block or block group level.	At TAZ level. 1500 TAZs in 6 county area. TAZs are composed of block groups and are smaller than tracts.	Model at TAZ level - TAZs are subdivisions of census tracts & roughly analogous to block groups. 851 TAZs.	30,000 Master Geographic Reference Area (MGRAs) - represent split census blocks; consistent with census tracts, TAZs, and Community Planning Areas.
8	Land Use Models - Current	In-house regional econometric model provides control totals; residential and nonresidential real estate models use transportation model travel times and policy info. GIS-based tool, "Metroscope," used to display/track results.	Do not use formal model. Have calibrated a DRAM/EMPAL model for the 4-county Sacramento area, but have not implemented it.	Spreadsheet model based on density specific growth rates.	Urban Development Model (UDM) designed and built in-house; uses modified version of gravity algorithm used in EMPAL and has direct links to GIS based land use data system.
9	Land Use Models - Future	Convert parcel level data to block face data for input to TRANSIMS. Modify nonresidential model to incorporate endogenous wage rates and make output of more economic sectors endogenous.	Examining several choices to enhance current process. Considering 2 sketch level-GIS models: UPLAN and the Smart Growth Index (SGI) model. Currently beta testing SGI.	UrbanSim - have contract with Paul Waddell to produce a locally-calibrated version. Beta version available later this year.	Same.
10	Land Use Modeling Categories	14 SIC categories cross-walk to 6 real estate categories – manufacturing, wholesale, retail, general office, medical/institutional and government. Distribution of SIC employment categories into the real estate categories is part of the nonresidential modeling calibration process. Therefore, use both SICs and land use.	Employment categories use SIC codes. Retail (52-59) office (40-49, 60-67, 91-97), manufacturing (20-39), medical (80), education (82), and other.	Not available at this time.	Households: 8 income categories, housing stock and occupied units by structure type. Employment: by 1-digit SIC code and self-employed. Land use: approx. 85 land use types aggregated to 14 developed and vacant land categories, including redevelopment, infill, and constrained land.
11	Travel Time/Accessibility Feedback Loop Between Transportation and Land Use Models	Incorporate travel times as a lagged endogenous variable. Equilibrium between residential and nonresidential models is achieved in less than 5 iterations. Iterative loops within each real estate model take somewhat longer to reach equilibrium.	In DRAM/EMPAL development, used a composite time and cost for all modes to feed accessibility from the travel model to DRAM/EMPAL. Took the AM period logsum number from the HBW joint distribution-mode choice model.	Will be present in UrbanSim.	Land use models link to transportation models via travel time matrices & access weights, which are based on accessibility and a measure of mass defined as employment & housing stock. there is only one iteration between the land use and transportation models, although access weights and travel times are recomputed for each 5-yr increment.
12	Conversion to Transportation Model Input	Presently, data at the 1/4 acre level are converted to TAZs using ArcInfo Grid. For TRANSIMS, parcel level data will be converted to block face input.	Employment by categories used directly. Housing unit data split into households in 3 categories (number of persons, workers, and income classes). TAZ disaggregation process uses baseline shares of households as guides.	Not available at this time.	Housing and employment capacities by land use polygon aggregated to TAZs are used to recompute trip generation output for the next transportation increment.
13	Review Process (Technical and Policy)	Peer review panels and technical user groups conduct detailed technical review. Local planning officials and elected officials review at policy level. Model output and regulatory decisions such as UGB expansion are subject to review at state level and may be appealed and litigated by private & governmental organizations.	All planning departments review draft data sets, then the Boards of Directors (city council and county supervisors) adopt the projections.	Projections & methodology reviewed by local planners and Socioeconomic Projections Working Group. Final results approved by Regional Council and each city.	Technical: logical consistency checks by a series of statistical runs. Policy: scrutinized by technical committees, then approved by SANDAG Board of Directors.
14	Projections Used in Transportation Conformity	Every 2 years partly update allocations of households and employment for use in transportation plan.	Adopted projections.	Same as for other planning analyses.	Population projections from the latest growth forecasts.
15	Land Use Scenarios Generated to Meet Clean Air Act (CAA) Requirements	2040 Growth Concept, the adopted land use scenario, is part of air quality maintenance plan for ozone and CO. This compact urban form reduces auto drive alone trips and VMT.	No.	No.	Evaluated alternatives related to varying degrees of implementation of smart growth policies.
16	Enhancements to Land Use Models for Air Quality Planning	Real estate location models that interact with transportation models ("Metroscope") will be used for future Regional Transportation Plans.	None.	None.	Feedback of travel times from transportation models to growth models was implemented.

	TRANSPORTATION MODELING	PORTLAND (METRO)	SACRAMENTO (SACOG)	SALT LAKE CITY (WFRC)	SAN DIEGO (SANDAG)
1	**Agency**	Metro Transportation Planning	Sacramento Area Council of Governments	Wasatch Front Regional Council	San Diego Association of Governments
2	**Transportation Models - Current**	4 step model with logit based mode choice and distribution modules. Trip generation is based on household size, income and age. Trip assignment model is EMME2.	MINUTP with supplemental programs (in qbasic) for auto ownership, trip generation, and specialized data management tasks.	TP+/VIPER; trip generation - cross-classification, attractions - regression; distribution - gravity model; mode choice - nested logit; assignment - equilibrium, capacity restraint with 24-hr trip table.	TRANPLAN.
3	**Transportation Models - Future**	Replacing 4 step model with tour based model operated as a set of nested logit equations. Anticipate using TRANSIMS for network assignment. Transportation models will link to real estate/land use models on a five year iterative cycle.	TP+/VIPER or TransCAD		Plan to convert within a year - new modeling package not selected yet.
4	**Enhancements to Transportation Models to Meet CAA requirements**	Made transportation model internally consistent (subject to travel demand being inelastic) with respect to travel times. Tour based model will work interactively with land use models.	Travel impedance fed back to accessibility inputs in auto ownership & trip distribution; accessibility measures include time and cost of all modes; non-vehicular modes included in trip generation, distribution, and mode choice; the automobile portion of the drive to transit trips are included in vehicle assignment; 3 assignment periods are used rather than a daily total, with an overall RMSE of 28%, AM RMSE of 25%, and PM RMSE of 23%; transit assignments are within 4% for total linked trips and 17% for boardings.	Feedback, regional (vs. urbanized area) distribution, auto ownership model, time-of-day modeling, and improved rail modeling. An urban activity model is under development to incorporate land use/transportation interactions.	Thoroughly coding proposed transportation projects in network-based travel model.
	AIR QUALITY/TRANSPORTATION CONFORMITY MODELING				
1	**Agency**	Metro Transportation Planning	Sacramento Area Council of Governments	Wasatch Front Regional Council	Air Pollution Control District, County of San Diego.
2	**Nonattainment Area/Classification**	Maintenance area for CO and ozone.	SACOG region includes 2 air basins. Sacramento ozone area is a severe nonattainment area. Sacramento urbanized area is a maintenance area for CO. Sacramento County is a nonattainment area for PM-10. Yuba-Sutter area is a nonattainment area for ozone, being classified transitional.	Salt Lake & Davis Counties are maintenance areas for ozone. Salt Lake City is a maintenance area for CO. Ogden is a moderate nonattainment area for CO. Salt Lake County is a moderate nonattainment area for PM-10.	Serious nonattainment area for ozone.
3	**Air Quality Models - Current**	Latest version of MOBILE.	EMFAC7f & DTIM2	MOBILE5AH,MOBILE5B, Part 5, UAM (Urban Airshed Model) for ozone, UAM-Aero for PM-10.	California Air Resources Board EMFAC7F1.1 (for emission factors) and Caltrans' DTIM2.
4	**Air Quality Models - Future**	MOBILE6	Latest version of EMFAC; DTIM or BURDEN		

	SOCIOECONOMIC MODELING	SAN FRANCISCO (ABAG)	SEATTLE (PSRC)	TUCSON (PAG)
1	Agency	Association of Bay Area Governments	Puget Sound Regional Council	Pima Association of Governments
2	Total Population	6,900,000	3,190,000 (April 1,1999)	854,239
3	Land Area	400 sq mi	6298 sq mi; 963 sq mi in Urban Growth Area	9,000 sq mi
4	Annual Rate of Population Growth (Past 5 Yrs)	1.70%	1.38%	3.30%
5	Methodology - Regional Projections	Internal input-output and cohort survival models.	Synchronized Translator of Economic Projections (STEP) used to forecast regional economic and demographic variables. Allocation to 219 Forecast Analysis Zones (FAZs) done with a modified version of DRAM/EMPAL. County totals are aggregated from the FAZ forecasts.	Pima County employment and population projections provided by Arizona Department of Economic Security.
6	How Often are Projections Generated? What is the Forecasting Time Horizon?	Every other year with a horizon of 20 years in 5 yr increments.	Every 3 yrs at beginning of the update of the Metropolitan Transportation Plan (MTP). Horizon: 2000-2030 in 10 yr increments. Annual revisions using latest current estimates of housing, population and employment are made holding regional control totals constant.	Every 5 yrs with a 25 yr horizon, coinciding with long range transportation plan update. Projections are updated as needed when new information becomes available.
7	Levels of Geography & Consistency with Census Geography	Estimates are at census tract level.	219 FAZs (aggregations of census tracts), 832 TAZs (tract or its subdivision); TAZs are aggregations of census blocks, but do not follow block group boundaries.	Model 635 internal and 11 external TAZs. TAZs generally conform to census block layouts and follow section lines and subsection lines within older urbanized areas.
8	Land Use Models - Current	Internal model, POLIS, distributes regional estimates to 119 zones across nine counties. POLIS is a nonlinear programming model based on utility optimization for residential and job choice.	Internally-modified version of DRAM/EMPAL.	No land use model currently used.
9	Land Use Models - Future		Will initiate development of new Urban Activity Modeling suite in July 2000; will incorporate latest theories of urban activity and advanced GIS.	Evaluating UrbanSim and DRAM/EMPAL.
10	Land Use Modeling Categories	Job categories - agriculture, manufacturing, wholesale, retail, service and other; these are aggregations of SIC codes.	Land use: residential, retail, non-retail, roads, undevelopable & vacant. DRAM/EMPAL allocates single-family and multifamily households and employment in retail, government, education, WTCU (wholesale, transportation, communications, & utilities), manufacturing, FIRE (financial, insurance and real estate) sectors - based on SIC codes.	Employment: 6 categories- retail, wholesale, office, industrial, service, and public service. 7 categories of special generators: regional shopping, Air Base, International Airport, University of Arizona, Pima Community College, medical centers, and prisons. 3 categories of school enrollment. Employment categories are based on both SIC/NAICS and land use.
11	Travel Time/Accessibility Feedback Loop Between Transportation and Land Use Models	No, but POLIS uses travel times from previous models to estimate location.	Accessibility in the land use model is fed back from the travel demand model. 2-3 iterations performed. Accessibility inputs are peak AM travel times or a composite cost matrix.	Use feedback loop in travel demand model to get congested travel time/accessibility feedback into the process prior to mode choice.
12	Conversion to Transportation Model Input	Census tract data are converted to TAZs via a correspondence table.	FAZ allocations made to TAZs using information provided by member jurisdiction planners. Existing fractions are used if no information is provided.	Do not have benefit of a formal land use model at present.
13	Review Process (Technical and Policy)	Draft numbers reviewed by cities & counties. Adopted by ABAG board.	Expert panel develops consensus at regional level. Sub-committee of Regional Technical Forum develops consensus at TAZ aggregation.	PAG has a Population Technical Advisory Committee for review and approval of land use projections. PAG staff periodically reviews land use projections for reasonableness as model runs are done for benchmark modeling years and for air quality conformity modeling.
14	Projections Used in Transportation Conformity	Adopted population projections are used in conformity; they are also used by transportation & air quality agencies.	Use latest planning assumptions which are refined periodically as part of maintaining the long range transportation plan.	Use population projections agreed upon by the Population Planning Committee.
15	Land Use Scenarios Generated to Meet Clean Air Act (CAA) Requirements	No.	No.	Model build and no-build scenarios.
16	Enhancements to Land Use Models for Air Quality Planning	Unknown.	None.	No formal land use model in place at this time.

	TRANSPORTATION MODELING	SAN FRANCISCO (ABAG)	SEATTLE (PSRC)	TUCSON (PAG)
1	**Agency**	Metropolitan Transportation Commission (MTC)	Puget Sound Regional Council	Pima Association of Governments
2	**Transportation Models - Current**	BAYCAST 90, described on the MTC web site.	EMME/2 environment with version of UMODEL for mode choice. Structure similar to UTPS with enhancements, (i.e., park-and-ride lots, ferry terminals, at-grade train crossings).	TRANPLAN; currently developing TP+ and VIPER
3	**Transportation Models - Future**		New model being tested adds a trip purpose, discrete vehicle occupancies, & non-motorized modes within the EMME/2 environment.	Planning to test TRANSIMS
4	**Enhancements to Transportation Models to Meet CAA requirements**	See above.	Load auto-access portion of park-and-ride trips directly onto the road network; revised time-of-day trip making characteristics for AM, PM and off-peak highway and transit assignments.	Validated 1995 and 1998 models using traffic counts - have annual traffic count program. Have analyzed models for validity by comparing outputs to national averages. Also, have been collecting speed and travel time data on major and minor arterials using GPS techniques, to test the validity of initial link speed assumptions and loaded link speed outputs.
	AIR QUALITY/TRANSPORTATION CONFORMITY MODELING			
1	**Agency**	Bay Area Air Quality Management District	Puget Sound Regional Council	Pima Association of Governments
2	**Nonattainment Area/Classification**	In April 1998 redesignated attainment for CO. In August 1998 redesignated nonattainment-unclassified for ozone.	No.	Nonattainment area for CO - not classified.
3	**Air Quality Models - Current**		MOBILE5A applied to output from the travel demand model; project level conformity analyses are done by sponsoring agencies.	MOBILE5A for emissions & CAL3QHC for hotspot modeling.
4	**Air Quality Models - Future**			MOBILE6 & Urban Airshed Model (UAM).

For more information contact
Rita Walton
Information Services Manager
rwalton@mag.maricopa.gov
(602) 254-6300
or
Anubhav Bagley
Decision Support Analyst
abagley@mag.maricopa.gov
(602) 254-6300

www.mag.maricopa.gov

MARICOPA
ASSOCIATION of
GOVERNMENTS